

## Honors Mathematical Toolkit: Review

### Metric Prefixes

Write the name for each metric prefix shown below:

1.) mg = \_\_\_\_\_

2.) nm = \_\_\_\_\_

3.) pm = \_\_\_\_\_

4.) dag = \_\_\_\_\_

5.)  $\mu\text{m}$  = \_\_\_\_\_

Fill in the appropriate scientific notation with each measurement

6.) 4.57 Gigameters = \_\_\_\_\_

7.) 3.98 centiseconds = \_\_\_\_\_

8.) 9.75 kilometers = \_\_\_\_\_

9.) 7.40 milliseconds = \_\_\_\_\_

10.) 5.2 Megagrams = \_\_\_\_\_

### Significant Figures

Determine the number of significant figures in the numbers given below.

1.) 0.0068 = \_\_\_\_\_

2.) 1.072 = \_\_\_\_\_

3.) 300.0 = \_\_\_\_\_

4.) 20.03 = \_\_\_\_\_

5.) 0.0030200 = \_\_\_\_\_

6.) 91010 = \_\_\_\_\_

7.)  $9.0 \times 10^{-3}$  = \_\_\_\_\_

8.) 780. = \_\_\_\_\_

9.) 918.010 = \_\_\_\_\_

10.) 8120 = \_\_\_\_\_

### Scientific Notation

Express the numbers below in correct scientific notation.

1.) 61,500 = \_\_\_\_\_

2.) 321 = \_\_\_\_\_

3.) 0.0000563 = \_\_\_\_\_

4.) 0.07085 = \_\_\_\_\_

5.) 0.0003009 = \_\_\_\_\_

Express the numbers below in correct standard notation

6.)  $1.09 \times 10^3$  = \_\_\_\_\_

7.)  $9.004 \times 10^{-2}$  = \_\_\_\_\_

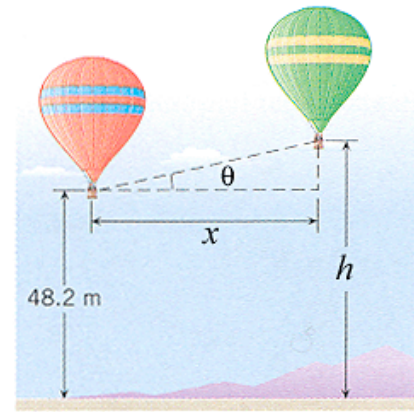
8.)  $3.078 \times 10^{-4}$  = \_\_\_\_\_

9.)  $4.22715 \times 10^8$  = \_\_\_\_\_

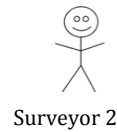
10.)  $5.60 \times 10^1$  = \_\_\_\_\_

### Trig

1. The two hot air balloons in the drawing to the right are at heights of 48.2 m and 56.0 m above the ground. A person in the left balloon observed that the right balloon is  $\theta = 15.4^\circ$  above the horizontal. What is the horizontal distance ( $x$ ) between the balloons?



2. \*Challenge Problem - In order to measure the height of a tree, two measurements are made. Surveyor 2 stands to the left of the tree, where the angle of from the ground to the top of the tree is  $25.0^\circ$ . Another surveyor, Surveyor 1, stands to the right of the tree, but 25.0 m closer. The angle from the ground to the top of the tree is  $45.0^\circ$ . What is the height of the tree?



### Converting Coordinates

**Convert the Rectangular Coordinates below to Polar Coordinates**

1.) (-3.00, 8.00)

2.) (-2.00, -2.00)

3.) (5.50, -4.90)

**Convert the Polar Coordinates below to Rectangular Coordinates**

4.) (7.50,  $150.0^\circ$ )

5.) (2.10,  $-40.0^\circ$ )

6.) (0.750,  $25.0^\circ$ )

### Vector Mathematics – Part I

You are given the following vectors:

Vector A: (3.00, 3.00)

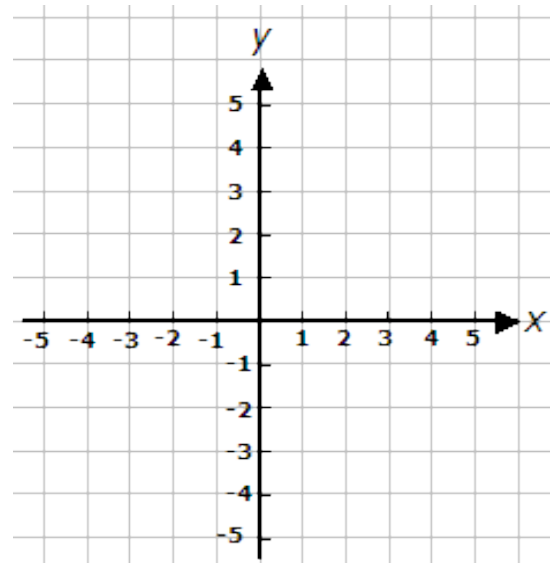
Vector B: (1.00, -1.00)

Vector C: (3.00, 2.00)

Vector D: (4.00, 0.00)

Vector E: (3.00, 6.00)

Sketch the Vector:  $A + 2B - C - D + E$  and its resultant  
Calculate the resultant in rectangular coordinates



Then, change coordinates of the resultant to polar coordinates

### Vector Mathematics – Part II

You are given three vectors (A, B, and C)

- Vector A (66.0, 28.0°)
- Vector B (40.0, 124°)
- Vector C (46.8, 270.0°)

Convert each of the vectors into rectangular coordinates

Using the coordinates for Vectors A, B, and C, calculate the resultant from the following vector combinations. The resultant's coordinates may be left as rectangular coordinates.

1.)  $B - A$

2.)  $2B - C$

### Vector Mathematics - Part III

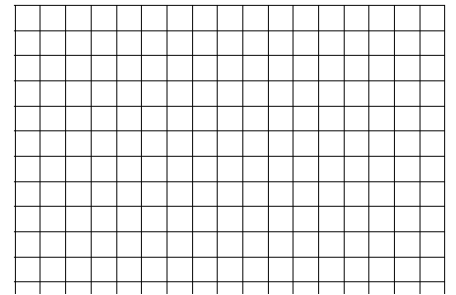
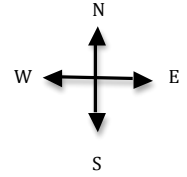
A poor physics professor has lost his keys and is wandering about trying to find them.

- He heads 60.0 m due east.
- He then turns and goes 280.0 m due south.
- Following that, he turns and heads  $30.0^\circ$  south of west for 140.0 m.
- Finally, he goes 160.0 m in a direction  $60.0^\circ$  north of west.

Create a rough sketch the movements of the poor professor.

Calculate the resultant or his overall displacement.

*\*You may express your answer in rectangular coordinates, but be careful of your angles on this problem.*



## Honors Mathematical Toolkit Review

### Numerical Solutions:

#### Metric Prefixes

- 1) milligrams
- 2) nanometers
- 3) picometers
- 4) dekagrams
- 5) micrometers
- 6)  $4.57 \times 10^9$  m
- 7)  $3.98 \times 10^{-2}$  s
- 8)  $9.75 \times 10^3$  m
- 9)  $7.40 \times 10^{-3}$  s
- 10)  $5.2 \times 10^{-6}$  g

#### Significant Figures

- 1) 2
- 2) 4
- 3) 4
- 4) 4
- 5) 5
- 6) 4
- 7) 2
- 8) 3
- 9) 6
- 10) 3

#### Scientific Notation

- 1)  $6.15 \times 10^4$
- 2)  $3.21 \times 10^2$
- 3)  $5.63 \times 10^{-5}$
- 4)  $7.085 \times 10^{-2}$
- 5)  $3.009 \times 10^{-4}$
- 6) 1,090
- 7) 0.09004
- 8) 0.0003078
- 9) 422,715,000
- 10) 56.0

#### Trig

1.  $x = 28.3$  m
2. Height = 21.8 m

#### Converting Coordinates:

1.  $(-3.00, 8.00) = (8.54, 111^\circ)$
2.  $(-2.00, -2.00) = (2.83, 225^\circ)$
3.  $(5.50, -4.90) = (7.37, -41.7^\circ)$
4.  $(7.50, 150.0^\circ) = (-6.50, 3.75)$
5.  $(2.10, -40.0^\circ) = (1.61, -1.35)$
6.  $(0.750, 25.0^\circ) = (0.680, 0.317)$

#### Vector Mathematics - Part I

Resultant (1, 5) = (5.10, 78.7°)

#### Vector Mathematics - Part II

Rectangular Coordinates:

Vector A  $(66.0, 28.0^\circ) = (58.3, 31.0)$

Vector B  $(40.0, 124^\circ) = (-22.4, 33.2)$

Vector C  $(46.8, 270.0^\circ) = (0, -46.8)$

1.  $B - A = (-80.7, 2.20)$
2.  $2B - C = (-44.8, 113)$

#### Vector Mathematics - Part III

Resultant (-141, -211)